Question	Scheme	Marks
6(i)	E.g $7^{x+3}=5\Rightarrow(x+3)\log 7=\log 5\Rightarrow x=\dfrac{\log 5}{\log 7}-3$ or $x+3=\log_7 5\Rightarrow x=...$ Alt: $7^{x+3}=5\Rightarrow 7^x=\dfrac{5}{7^3}\Rightarrow x=\log_7\dfrac{5}{343}$	**M1**
	$=-2.17$	**A1**
		(2)
(ii)(a)	$\log_8 64y^3=\log_8 64+\log_8 y^3$ or $\log_8 y^3=3\log_8 y$ or $\log_8 64=2$ Or $\log_8\left(64y^3\right)\Rightarrow\log_8\left(4y\right)^3\Rightarrow 3\log_8\left(4y\right)$ or $\log_8 4=\dfrac{2}{3}$	**M1**
	$18\left(\log_8 y\right)^2+5\log_8\left(64y^3\right)=73\Rightarrow 18\left(\log_8 y\right)^2+5\log_8 64+5\log_8 y^3=73$ $\Rightarrow 18\left(\log_8 y\right)^2+5\times 2+15\log_8 y=73$	**dM1**
	$\Rightarrow 18\left(\log_8 y\right)^2+15\log_8 y-63=0\Rightarrow 6\left(\log_8 y\right)^2+5\log_8 y-21=0$*	**A1***
		(3)
(b)	$\left(2\log_8 y-3\right)\left(3\log_8 y+7\right)=0\Rightarrow\log_8 y=\dfrac{3}{2},-\dfrac{7}{3}\Rightarrow y=8^k$	**M1**
	e.g $y=8^{\frac{3}{2}}$ or $8^{-\frac{7}{3}}$ oe	**A1**
	e.g $16\sqrt{2}$ or $\sqrt{512}$ and $\dfrac{1}{128}$ oe	**A1**
		(3)
		(8 marks)

Notes:

(i)

M1: Correct method for solving to find *x*, e.g. takes logs and rearranges, as shown in scheme. May divide through by 7^3 first or take log to base 7. There must be evidence of correct use of logs.

A1: Correct answer, accept awrt -2.17

(ii)(a)

M1: Attempt the sum or power law of logs on the $\log_8 64y^3$ or applies $\log_8 64=2$ in the proof or

Note this cannot be scored for an attempt at $\left(\log_8 y\right)^2=2\log_8 y$

dM1: Correct use of both the sum and the power law of logs seen or implied on the $\log_8 64y^3$ term and simplifies the $\log_8 64$ to achieve a quadratic in any form.

A1*: Correctly rearranges to the printed equation **with no errors seen** and use of the log laws clear.

(b)

M1: Solves the **given** quadratic and uses a correct method to obtain at least one solution for *y* from an equation of form $\log_8 y=k$. i.e., $\log_8 y=k\Rightarrow y=8^k$. Accept a calculator method to solve the 3TQ.

A1: At least one correct **exact** answer in either exponential or numerical form.

A1: Both correct, accepting any equivalent **exact** forms. ie., exponential or numerical

Question	Scheme	Marks
7(a)	(3,6)	B1
		(1)
(b)	Gradient $= \frac{6-0}{3-0} (=2)$	M1
	Hence equation of l is $y = 2x$	A1
		(2)
(c)	Distance from O to centre is $\sqrt{3^2+6^2} = ... \left(= 3\sqrt{5}\right)$	M1
	$\Rightarrow r = 3\sqrt{5} \pm \sqrt{5}$	M1
	For radius either $2\sqrt{5}$ or $4\sqrt{5}$ or one correct value for k	A1
	For both 20 and 80	A1
		(4)
		(7 marks)

Notes:

(a)

B1: Correct centre. Allow $x = 3$, $y = 6$

(b)

M1: Attempts the gradient from O to the centre. May be implied by $\pm\frac{6}{3}$ ft their centre.

OR from the equation $y = 2x$ seen.

A1: Correct equation from correct centre.

(c)

M1: Attempts the distance from the origin to the centre of the circle.

M1: Finds the radius as the sum or difference of their distance and $\sqrt{5}$

A1: For one of the two possible radii correct or one of the two possible values for k correct.

A1: Both values correct.

Alt 1(c)		
	A lies on the line $y = 2x \Rightarrow x^2 + (2x)^2 = \left(\sqrt{5}\right)^2 \Rightarrow x = ...$	M1
	$\Rightarrow k = \left("\pm 1" - 3\right)^2 + \left("\pm 2" - 6\right)^2 = ...$	M1
	One of 20 or 80 ; both 20 and 80	A1;A1
		(4)

M1: Uses the equation to obtain a general point on the line and applies distance $OA = \sqrt{5}$ to find at least one x coordinate.

M1: Uses their coordinates of A to find at least one value for k using the circle equation.

A1: One of the two possible values for k correct.

A1: Both values correct.